CLAIMS

While the invention has been described with reference to particular example embodiments, further modifications and improvements which will occur to those skilled in the art, may be made within the purview of the appended claims, without departing from the scope of the invention in its broader aspect.
Numerous modification and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

What is claimed is:

Claims 1-22 canceled.

23. (new) A noise filtering edge detector (NFED) for recovering digital signal transitions and their phases from noisy waveforms while assuming ideal signal shape between the transitions, in order to identify digitally transmitted data, by continues over-sampling and digital filtering of the incoming waveform based on comparing an edge mask, representing an expected pattern of wave-form samples corresponding to an edge of the original wave-form, with a sequence of wave-form samples surrounding a consecutive analyzed sample; the NFED comprising:

a wave capturing circuit for capturing results of sampling the incoming wave-form in time instances produced by the outputs of the delay line which the sampling clock is propagated through;

a correlation calculating circuit for performing logical or arithmetic operations on particular samples of the edge mask and their counterparts from a wave samples region surrounding the consecutively analyzed sample of the captured wave-form, in order to calculate a correlation integral between the wave samples region and the edge mask;

a proximity estimating circuit for deciding if there is an edge occurrence at the consecutively analyzed sampling instant based on processing of such correlation integrals calculated for samples belonging to a surrounding wave region.

24. (new) A noise filtering edge detector (NFED) for recovering digital signal transitions and their phases from noisy waveforms while assuming ideal signal shape between the transitions, in order to identify digitally transmitted data, by continues over-sampling and digital filtering of the incoming waveform based on comparing an edge mask, representing an expected pattern of wave-form samples corresponding to an edge of the original wave-form, with a sequence of wave-form samples surrounding a consecutive analyzed sample; the NFED comprising:

a wave capturing circuit, connected to a sampling clock and to the incoming waveform, for continues over-sampling of the incoming wave-form;

a correlation calculating circuit for performing logical or arithmetic operations on particular samples of the edge mask and their counterparts from a wave samples region surrounding the consecutively analyzed sample of the captured wave-form, in order to calculate a correlation integral between the wave samples region and the edge mask;

a proximity estimating circuit for deciding if there is an edge occurrence at the consecutively analyzed sampling instant based on processing of such correlation integrals calculated for samples belonging to a surrounding wave region.

25. (new) An edge detecting filter (EDF) for recovering data carrying edges from a noisy received signal by dense over-sampling of the received signal and by detecting edge phases and edge amplitude limits wherein recovered signal amplitudes at sampling instance defining said edge phase are determined by said edge amplitude limits while recovered amplitudes assumed at sampling instances following the last edge detected are those implementing an ideal signal shape determined by the last edge; the edge detecting filter comprising:

a wave capturing circuit for such over-sampling of the received signal and for capturing a wave-form sampled;

a wave-form processor estimating correlations between a set of wave-form samples surrounding an analyzed consecutive sample and their counterparts from an edge mask, and for combining such estimates of individual bits correlations into a correlation integral

characterizing level of similarity between the surrounding set of samples and the edge mask;

the wave-form processor analyzing such correlation integrals in order to decide if there is an edge at the analyzed consecutive sample and to detect edge phase and edge amplitude limits if said edge does occur.

26. (new) An EDF as claimed in claim 25, wherein the waveform processor comprises:

parallel processors for simultaneous calculation of correlation integrals for a multiplicity of waveform samples belonging a captured waveform interval in which said data carrying edge is expected.

27. (new) An EDF as claimed in claim 25 using a method and system for synchronous sequential processing (SSP), which multiplies processing speed by splitting complex signal processing operation into a sequence of singular micro-cycles, for implementing the functions of the wave capturing circuit and the waveform processor; wherein the SSP comprises:

multiple serially connected sequential stages clocked by reference sub-clocks generated by a reference propagation circuit built with serially connected gates which a reference clock is propagated through, wherein every such serially connected stage is designated to perform a basic logical or arithmetical operation during such consecutive singular micro-cycle of the complex operation;

a configuration of parallel processing stages of the received signal, wherein multiple processing stages are driven by the same sub-clock which is applied simultaneously to inputs of output registers of all the parallel stages.

28. (new) An EDF as claimed in claim 25 further including adaptive noise filtering using a programmable control unit (PCU) for an adaptive compensation of the received signal noise by analyzing selected intervals of the captured waveform and by modifying said

edge masks and/or by reprogramming functions performed by said waveform processor; the EDF further comprising:

a waveform screening and capturing circuit (WFSC) for accessing and buffering of pre-selected intervals of said captured waveform;

the programmable control unit for said analysis of noise and/or distortions occurring in said pre-selected intervals; and for implementing adaptive noise compensation algorithms by said modifications of the edge masks and/or by said reprogramming of the waveform processor.

29. (new) An edge detecting filter (EDF) for recovering data carrying edges from a noisy received signal by dense over-sampling of the received signal and by detecting edge phases and edge amplitude limits wherein recovered signal amplitudes at sampling instance defining said edge phase are determined by said edge amplitude limits while recovered amplitudes assumed at sampling instances following the last edge detected are those implementing an ideal signal shape determined by the last edge; the edge detecting filter comprising:

a wave capturing circuit for such over-sampling of the received signal and for capturing a wave-form sampled;

a wave-form processor estimating correlations between a set of wave-form samples surrounding an analyzed consecutive sample and their counterparts from an edge mask, and for combining such estimates of individual bits correlations into a correlation integral characterizing level of similarity between the surrounding set of samples and the edge mask;

the wave-form processor analyzing such correlation integrals in order to decide if there is an edge at the analyzed consecutive sample and to detect edge phase and edge amplitude limits if said edge does occur, wherein said analysis includes finding an extreme of said correlation integrals in a waveform area expected to comprise a valid data carrying edge wherein such sampling instant which has such extreme correlation integral defines the edge phase recovered and the edge mask used defines the edge amplitude limits.

30. (new) A method for edge noise filtering (EFM) using time domain processing for recovering phases and amplitude ranges of data carrying edges from a noisy received signal while amplitudes occurring between the recovered edges are assumed to equal those implementing a known ideal signal shape determined by the last recovered edge, instead of spending processing resources on calculating every recovered amplitude and recovering data carrying edges from such incomplete amplitude oriented results deprived already of relevant phase/time related information; the method for edge noise filtering comprising the steps of:

dense over-sampling of the received signal and capturing resulting over-sampled waveform;

recovery of said phases and amplitude ranges of data carrying edges by time domain processing of the over-sampled waveform;

recovery of data transmitted from the phases and amplitude ranges of recovered edges;

or recovery of an entire signal transmitted originally by defining it's amplitudes as equal to those defined by said amplitude ranges at sampling instances defining said edge phases, and by defining it's amplitudes as equal to those implementing known ideal signal shape determined by the last recovered edge at sampling instances located between the last and next edges.